CALIFORNIA ECONOMIC STRATEGY PANEL
SPECIAL STATEWIDE FORUM ON THE CALIFORNIA AEROSPACE INDUSTRY CLUSTER

WHITE PAPER ON ISSUES AND OPPORTUNITIES

Issue: Data is lacking for the supplier portion of the California aerospace industry.

There appear to be signs that California companies which typically provide goods and services to the aerospace industry are growing. For instance, an article in the January 11, 1998 edition of the LA Times noted that "Southern California has emerged from the post-Cold War bust with a smaller but stronger aerospace industrial base that includes the largest precision machining and metalworking capability in the nation." Most reports on aerospace-related businesses are anecdotal, yet they apparently constitute a sizable portion of the total aerospace production in California. However, due to lack of data it is difficult to measure the size and trends of employment, payroll, and sales. Nor is it possible to identify the location of these companies nor the industries that these companies represent. In contrast, data is available for those companies that buy from the suppliers. The next section uses that data to describe the aerospace industry, and in the process illustrates what can be done with good data to describe an industry.

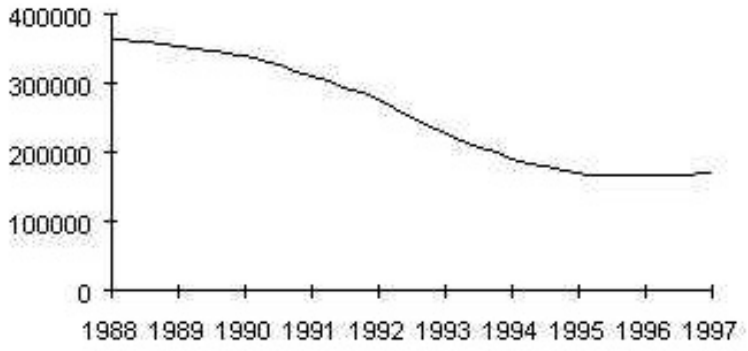
Defense-Related Aerospace Industry. Key data for aerospace industries are readily available. From this data it is possible to develop relative size comparisons and trends in order to understand the industry. Two, 3-digit Standard Industry Classification (SIC) codes directly identify aerospace industries. (The Standard Industry Classification Code scheme is established by the U.S. Government for the purpose of collecting employment, wages, and sales information for individual industries.) The Employment Development Department adds a third, manufacturing of navigation equipment, since a large portion is produced for aerospace applications. The three SIC codes are identified below, along with employment, payroll, and sales for California and the U.S. California employment exceeded 140,000 and sales approached $30 billion in 1996, and the state still has a high portion of the total U.S. aerospace industry. (See next table).

Defense-Related Aerospace Industry, California and the U.S.
1996

SIC Code	Description	California			U.S.		
		Emp (Thous)	Payroll ($ Mill)	Sales ($ Mill)	Emp (Thous)	Payroll ($ Mill)	Sales ($ Mill)
372	Mfg - Aircraft and parts.	67.0	3,463.0	13,518.5	376.0	18,732.5	83,393.6
376	Mfg - Missiles, space vehicles.	40.8	2,536.6	9,038.2	81.0	4,631.6	17,928.1
381	Mfg - Search, navigation eqpt.	36.8	2,107.8	5,533.8	186.3	9,540.1	30,371.3
	TOTAL	144.6	8,107.4	28,090.5	643.3	32,904.2	131,693.0
	Percent of U.S. (%)	22.4	24.6	21.3	-	-	-
Source: U.S. Census Bureau, 1996 Survey of Manufactures. (latest available)							

The combined total employment of the three SIC industries can be plotted to illustrate the large decline during the 1990s. The decline was due to defense cutbacks, the attraction of large production aerospace out of California, and the ensuing consolidation of remaining companies. Employment hit bottom in 1996, then increased in 1997, the first time since 1988 that California aerospace employment experienced a year-to-year growth. (See next graph). The aerospace industry that remains in California today contains companies that are smaller than their counterparts elsewhere, and a higher portion are devoted to engineering/design.

Total Employment, California Aerospace
(SIC 372, 376, 381)
1988 - 1997



Finally, data that exists for aerospace make it possible to measure aerospace activity by county.

Using data from Dun and Bradstreet, we find that seven of the ten California counties with the most aerospace companies are in the southern part of the state and three in the north. Nearly 90 percent of the aerospace companies in this state are in these ten counties. These ten also represent over seventeen percent of the *nation's* aerospace companies. (See next table). Ranking counties by employment is less certain, as employment data is not as well developed. Nevertheless, at least four of the nation's top ten aerospace counties ranked by employment are in California.

Ten Largest Aerospace Counties in California
Ranked by Percent of Total Companies

CA County	% of Total CA Aerospace Companies in the County	% of Total US Aerospace Companies in the County
	%	%
Los Angeles	36.5	7.3
Orange	16.5	3.3
San Diego	11.5	2.3
Santa Clara	6.5	1.3
Ventura	3.3	0.7
San Bernardino	3.1	0.6
Alameda	3.1	0.6
Riverside	2.6	0.5
Santa Barbara	2.6	0.5
San Mateo	2.1	0.4
TOTAL	87.8	17.5

Aerospace-related industries. Similar data is not available for suppliers to the aerospace industry. Suppliers are from a variety of industries other than the three noted above, but the extent of that variety is not known, nor is the count of firms. The final user of those supplies are not identified. Thus, the economic activity associated with supplying the aerospace industry is difficult to measure. There may be another 50,000, 100,000, 150,000, or more employed in aerospace-related industries. Of particular interest are those high-tech companies in which a substantial portion of their products are used for aerospace applications. These may include manufacturers of computers, microprocessors, machine tools, metal forming/forging/castings, composite materials, as well as software, engineering, and research services. Their impact upon the economy may also be large, but is unknown for this industry.

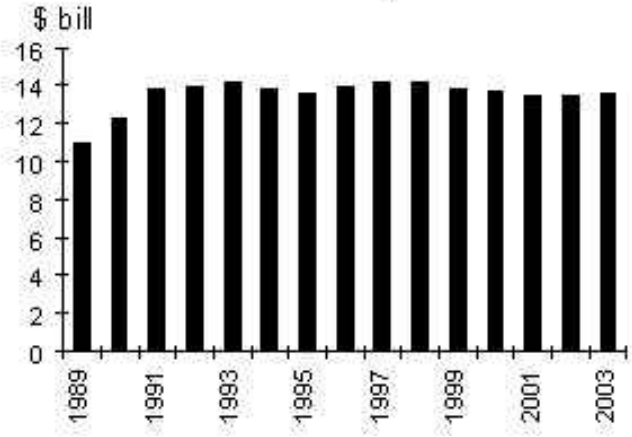
Suppliers are getting increased attention by the aerospace industry. One of the Aerospace Industries Association (AIA) top ten issues for 1998 is to develop aerospace supplier relationships. AIA member companies are depending upon suppliers for innovation and cost reduction. Hence, increased management attention and priority is being placed on relationships with suppliers. The AIA has recently formed a Supplier Management Council to focus on these concerns.

Issue: Due to major changes in government aerospace budgets and due to consolidation of commercial air transport producers, an assessment of markets for California aerospace needs to be completed.

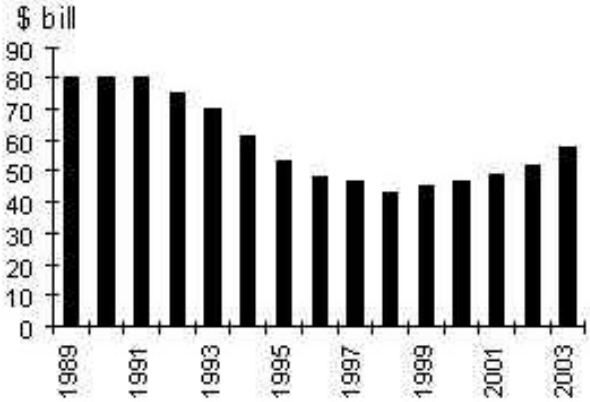
It is not only important to count the suppliers and measure their size, trends, and location, in order to fully understand the total aerospace industry in California. It is also important to understand the markets for California aerospace products. Some of the key market questions can be identified by reviewing government budgets and recent company decisions.

U.S. government budget. The U.S. government is the largest customer of U.S. aerospace products, but the market is changing. The aerospace industry's primary government customers, Department of Defense (DoD) and NASA both face substantial funding problems in the years ahead. In 1987, government purchases accounted for 75% of total aerospace sales; in 1997 it was 50%. The NASA budget will remain relatively flat. (See NASA graph). The agency has been forced to leverage the cost of projects with private partners. For instance, NASA is providing only seed money for the design and construction of the X-33 reusable launch vehicle. The two DoD accounts having the greatest impact on aerospace companies are procurement, and research, development, testing and evaluation (RDT&E). Procurement has been falling since the late 1980s, but it now appears that a bottom has been reached. RDT&E, however, will decline as certain military aerospace programs will move from research into production without commensurate replacement of new research funds. (See RDT&E graph).

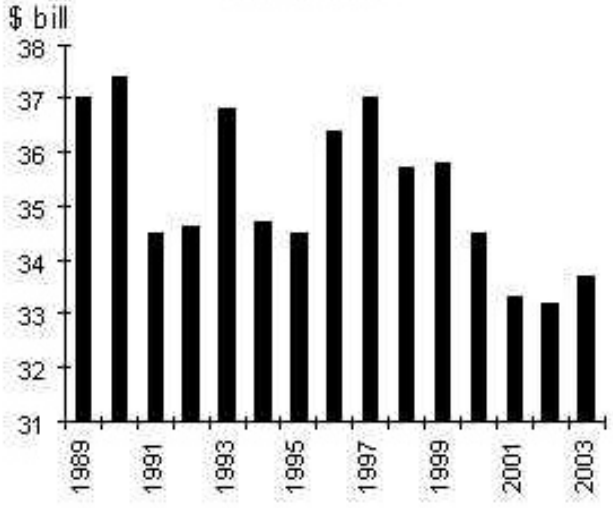
NASA Outlays



DoD Procurement



DoD RDT&E



Source: AIA analysis of the FY 1999 Budget of the U.S. Government.

Further detail is needed, however, to understand which government aerospace projects within the above agency budgets hold the most promise for California aerospace. As an example, California still does a high portion of research and prototyping projects. For instance, the final assembly, checkout, and first flights of the two demonstrator Joint Strike Fighters is scheduled this summer in Palmdale. However, given the projected decline in the RDT&E budget of DoD, California companies may have to position themselves differently. The flattened NASA budget indicates that California companies will not easily win contracts for space projects unless the state's competitive advantages are well documented. DoD procurement may be rising but further information is needed to determine which program(s) account for the increase, and which holds the best potential for California companies.

Recent company decisions. Opportunities need to be identified for commercial aerospace, and how California can participate in those projects. Production of commercial transport aircraft has an uncertain future in California. Boeing has renamed the MD95 to the 717, and assembly is expected to remain in Long Beach. Program management however, may be transferred to Washington after the 717 earns FAA certification. In June, 1998, Boeing announced that the production of the older MD11, which employs about 3,000 in Long Beach, will be phased out over the next 18 months. Many components for transport aircraft, Boeing or otherwise, are made in California, and these need to be identified, and their viability assessed.

Key decisions by aerospace companies are another source of information. These decisions provide insight as to California's role in major projects, and those decisions need to be investigated further. Major aerospace companies make the final decisions where to locate projects once they successfully bid. The streamlining plan announced by Boeing on March 20, 1998 serves as an example. Boeing has 42,900 employees in California, but will reduce that by 6,200 by the year 2000, a decline of nearly 15 percent. A majority of the 8,200 company-wide employment reductions announced March 20 are therefore scheduled for California. (The 8,200 reduction does not include intentions previously announced by Boeing on December 16 to reduce commercial airplane employment worldwide by 12,000 beginning in the second half of 1998.) A closer review indicates that some of the 6,200 reduction in California is associated with weak markets for the MD80 and MD90 aircraft inherited from the acquisition of McDonnell-Douglas, and probably would have been trimmed anyway. Other previously announced plans, such as moving and consolidating management positions to Washington headquarters for the remaining commercial aircraft that will be produced in Long Beach, have been put on hold.

Some of the reduction, however, is associated with moving some avionics out of the state, and electronics is usually considered a strong point for California. Boeing is also moving some tooling, machining and composite manufacturing out of the state to its Strategic Manufacturing Centers, none of which are in California. Boeing is responsible for much of the increase in precision machining mentioned in the first paragraph. Apparently, Boeing prefers to contract out for specialty machining rather than establish a Strategic Manufacturing Center in California.

Boeing is also generally keeping in California high-end, complex components to be installed elsewhere, and prototype, short-run vehicle production: rocket engines, space power systems, lasers, satellites, expendable and reusable launch vehicles, missiles, navigation,

sensors, demonstration vehicle, prototype vehicle assembly and test, and X-vehicles. The announcement is a good indicator of how one major aerospace company views the strengths and weaknesses of the state, and those perceptions need to be validated with further independent analysis.

Another company decision illustrates the ability of California to retain production of complex components, but not final assembly work. On April 9, Lockheed Martin announced that it had won a $2 billion advanced cruise missile program if all options are exercised by DoD. A total of 500 employees will be involved at its peak. The initial work will be at Lockheed Martin Skunk Works in Palmdale which excels at rapid-prototype, testing, and evaluation of the first few units. Once proven, final assembly is scheduled for a new facility in Alabama.

California organizations are taking a look at the issues reviewed here. Recently, a joint study of A. T. Kearney, the Los Angeles Regional Technology Alliance, and the Los Angeles Economic Development Corporation, titled *Beyond Consolidation*, reminded readers that consolidations are not yet over. The study recommended that existing economic development programs in California be targeted toward promising segments of commercial space, defense electronics, and new commercial markets. Detail of those new markets are given in the next section.

Issue: The Need to Take Advantage of New Markets and Technology Application

The defense downturn of the 1990's left California particularly vulnerable to continued shifts in defense spending, as indicated earlier, as well as to increased consolidation for a shrinking pie among existing primes and first-tier subcontractors. As cost drivers factored prominently in this landscape, the advantages of incumbency did not favor California, which saw much work in the traditional segments of the industry migrate to other, lower-cost states like Alabama. These states also proved more strategic in their targeting of the industry, creating "pods" around specific sectors like space manufacturing in Huntsville or Fort Myers.

However, despite several attempts to develop and pursue "defense conversion" initiatives designed to help existing defense suppliers explore new markets for their technologies, the commercial market itself has rebounded in idiosyncratic ways. Most of such federally-sponsored initiatives are now dead. The communications explosion, accompanied by a boom in satellite design, manufacturing and deployment, coupled with an enormous appetite for high-bandwidth entertainment experiences (theme park rides, entertaining simulated adventures) and the exponential growth of the Internet itself, has provided the most nimble and imaginative defense companies with a curious edge in the development of new applications and technologies.

Among the satellite manufacturers, Hughes, for e.g. saw such a dramatic growth in its business as to continue its dominant position in the industry. Hughes is illustrative of the promise of new markets with roots in the aerospace industry. They have spun off one set of activities as DirectTV, a purely commercial venture based on satellite technology taken to the set top. They are currently pursuing a similar venture to capitalize on the need for high

bandwidth downloaded to the desktop, DirectPC. Both ventures, in turn, take advantage of the "space on the bird", Hughes's satellites in orbit.

Indeed, commercial space, as the LARTA/LAEDC/Kearney report has pointed out, is a perfect opportunity for the State to pursue. All the major players in that industry have considerable infrastructure investments in California. All have significant on-going programs (which show no indication of being discontinued, like the other defense programs). All are currently the most significant subcontractors or primes on a number of commercial satellite endeavors, and all can call on a pool of seasoned talent. In addition, the launch business has been revitalized by Boeing's investment in Sea Launch in Long Beach, and by the appearance of such entrepreneurial ventures as Kelly Space Technologies, providing innovative launch designs and capabilities.

The information and communications revolution reveals also the depth of technical expertise developed by companies for the Pentagon, which has traditionally been a large consumer of computing and communications. Some of these companies have been able to serve new markets which have sprung up in the last six years, especially in entertainment and digital archiving. Illusion, Inc., a software engineering company in Westlake Village started life as a defense company, and developed SimNet, the networked simulation system for the U.S. Army. It has emerged as an important creator of networked simulation rides (e.g. the Indy Car ride in Vegas) and of large, integrated networked systems for the emergency response jurisdictions in the State. While DoD business has been a cauldron for the development of new technologies, their commercial exploitation is successful only when the companies are capable of significantly altering their business models and their approach, something smaller companies are more inherently capable of doing.